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Inside

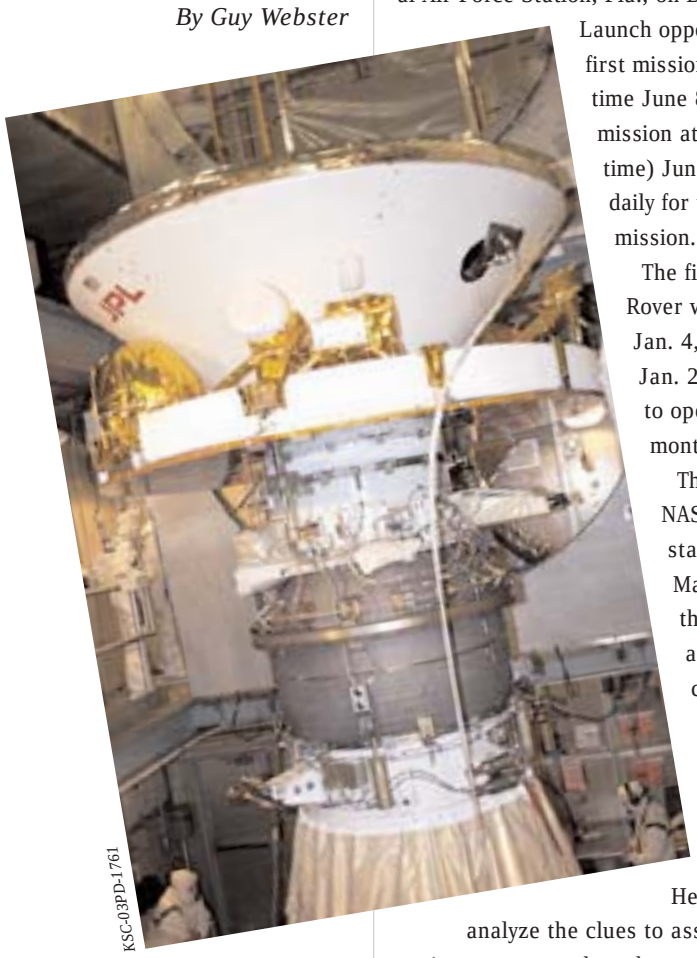
First rover to launch June 8

By Guy Webster

MER

JPL's Mars Exploration Rover project kicks off by launching the first of two unique robotic geologists on Sunday, June 8. The identical rolling rovers can see sharper images, explore farther and examine rocks better than anything that's ever landed on Mars. The second rover mission, bound for a different site on Mars, will launch as soon as June 25.

Both rover missions will lift off from Cape Canaveral Air Force Station, Fla., on Delta II launch vehicles. Launch opportunities begin for the first mission at 11:06 a.m. Pacific time June 8 and for the second mission at 9:38 p.m. (Pacific time) June 24, and repeat twice daily for up to 21 days for each mission.



The Mars Exploration Rover 2 is readied for takeoff at the Cape Canaveral launch complex.

The first Mars Exploration Rover will arrive at Mars on Jan. 4, 2004; the second on Jan. 25. Plans call for each to operate for at least three months.

These missions continue NASA' s quest to understand the role of water on Mars. "We will be using the rovers to find rocks and soils that could hold clues about wet environments of Mars' past," said Dr. Cathy Weitz, Mars Exploration Rover program scientist at NASA Headquarters. "We'll analyze the clues to assess whether those environments may have been conducive to life."

First, the rovers have to safely reach Mars. "The rovers will use innovations to aid in a safe landing, but risks remain," said Peter Theisinger, Mars Exploration Rover project manager at JPL.

The rovers will bounce to airbag-cushioned landings at sites offering a balance of favorable conditions for safe landings and interesting science. The designated site for the first mission is Gusev Crater. The second rover will go to a site called Meridiani Planum. "Gusev and Meridiani give us two different types of evidence about liquid water in Mars' history," said Dr. Joy Crisp, Mars Exploration Rover project scientist at JPL. "Gusev appears to have been a crater lake. The channel of an ancient riverbed indicates water flowed right into it. Meridiani has a large deposit of gray hematite, a mineral that usually forms in a wet environment."

The rovers, working as robotic field geologists, will examine the sites for clues about what happened there. "The clues are in the rocks, but you can't go to every rock, so you split the job into two pieces," said Dr. Steve Squyres of Cornell University, Ithaca, N.Y., principal investigator for the package of science instruments on the rovers.

First, a panoramic camera at human-eye height, and a miniature thermal emission spectrometer with infrared vision, help scientists identify the most interesting rocks. The rovers can watch for hazards and maneuver around them. Each six-wheeled robot has a deck of solar panels, about the size of a kitchen table, for power. The rover drives to the selected rock and extends an arm with tools on the end. Then, a microscopic imager, like a geologist's hand lens, gives a close-up view of the rock's texture. Two spectrometers identify the composition of the rock. The fourth tool substitutes for a geologist's hammer. It exposes the fresh interior of a rock by scraping away the weathered surface layer.

"We see the twin rovers as stepping stones for the rest of the decade and to a future decade of Mars exploration that will ultimately provide the knowledge necessary for human exploration," said Orlando Figueroa, director of the Mars Exploration Program at NASA Headquarters.

Additional information about the project is online at *http://mars.jpl.nasa.gov/mer*.

Lab has role in Europe's Mars Express

By Guy Webster

The European Space Agency's first mission to Mars, which launched June 2 from Baikonur, Kazakhstan, includes participation on several fronts by JPL.

The mission, Mars Express, will reach the Red Planet on Dec. 27 then examine it from an orbiter with seven instruments and on the surface with a lander named Beagle 2. The orbiter will point ground-penetrating radar at Mars for the first time, probing for evidence of underground water. Beagle 2 will conduct biochemical and geological tests at a different site than the two areas where JPL's Mars Exploration Rovers will land in January 2004.

"The exploration of Mars is an international adventure," said Dr. Cathy Weitz at NASA Headquarters. "Our rover missions have key participants in Europe, and there are U.S. scientists on the teams for every instrument on Mars Express."

U.S. roles in Mars Express include navigational support from JPL and communication support from the JPL-managed Deep Space Network.

JPL's Dr. Jeffrey Plaut is co-principal investigator for the orbiter's radar experiment, named the Mars Advanced Radar for Subsurface and Ionospheric Sounding. "We have very little information about the crust of Mars more than about a meter below the surface, but with this instrument we hope to probe as deep as 5 kilometers (3 miles)," he said.

"With the radar, we will try to detect boundaries between layers of different types of material," Plaut said. "If there is a boundary between a rock-ice mixture at the surface and a rock-water mixture at depth, it will reflect the radio waves and we hope to detect it. We'll be looking for aquifers—subsurface reservoirs of liquid water—but nobody really knows whether Mars has them."

The radar instrument might also detect other types of layer boundaries, such as between sediments and underlying volcanic rock, or between the polar ice caps and underlying liquid water. This type of instrument, carried by aircraft, has detected vast lakes under polar icecaps on Earth. It has not been used on another planet, though a similar instrument flew on an Apollo mission, said JPL's Richard Hortor, project manager for NASA's roles in Mars Express.

For more information about Mars Express, log on to *http://sci.esa.int/home/marsexpress* or *http://mars.jpl.nasa.gov/express*.

Cafe 167 to reopen soon

Open house set for June 16

By Mark Whalen

To celebrate the grand reopening of the Red Planet Cafe in Building 167, JPL staff are invited to see the refurbished eatery during a ribbon cutting ceremony and open house on Monday, June 16, from 2 to 3:30 p.m.

Complimentary punch, cookies, ice cream and yogurt will be served in honor of the event, a collaboration of JPL Employee Services and Caltech Dining Services personnel. Red Planet Cafe will be formally open for business during its normal operating hours, 6:30 a.m. to 3:30 p.m., beginning June 17.

Upon entering the Cafe, employees will immediately notice the new open floor plan and state of the art food-service equipment. A new char-broiler is installed and includes a glass case where patrons will select fresh beef, chicken or fish and watch it being prepared. A new and much larger salad bar is placed in the center of the service area and includes freshly prepared homemade soups.

A large salad bar stands in the center of the remodeled cafeteria's serving area. Made-to-order items will include sandwiches and fresh pasta (left) and pizza from a wood-burning oven (right).

Five "grab-and-go" food stations will feature premade sandwiches and salads. Customers will now be able to order their own freshly made pizza, as the Cafe features a wood-burning oven similar to the one in Cafe 303. Also introduced will be new rotisserie-like "combi" ovens that will be used to prepare special beef and chicken dishes. Pasta dishes will be prepared made to order too. And a self-service Dreyers ice cream and yogurt stand will also be available.

Another new change to the Red Planet Cafe will be the placement of the soda fountains. To expedite patron food service transactions, the fountains are placed outside of the main serving area and free refills will be available to those who use the same cup throughout the day.

"I think customers will really like the new food choices in Cafe 167," said Nancy Kapell of the Compensation, Employee Services and Recognition Section. "We have incorporated the new offerings along with old favorites, while adding more grab-and-go selections for those on the run."

The dining area of Red Planet Cafe seats about 350 and has new dining tables and chairs. In addition, new lighting was installed to brighten the eating area and make the room more cozy for patrons. Since many employees enjoy patio dining outdoors, all dining areas in the mall area will remain available too.

Suzanne Bradfield, manager of Employee Services and Recognition, added, "I believe the Laboratory population, as well as visitors, will enjoy the new updated look of Cafe 167. We appreciate the patience of Laboratory personnel during construction and look forward to serving customers in our beautiful new facility."

News Briefs

Galex first light dedicated to Columbia

NASA's Galaxy Evolution Explorer has gathered its first celestial images, a "first light" milestone dedicated to the crew of the Space Shuttle Columbia.

The JPL-managed ultraviolet survey mission, launched on April 28, made the observations using its onboard telescope. To honor the contributions of the Columbia astronauts to scientific exploration, Galex observed an area of the sky in the constellation Hercules. That region was directly above Columbia when it made its last contact to NASA Mission Control on Feb. 1, over the skies of Texas. During the 16-day mission, the shuttle crew completed 82 science experiments.

"We're really pleased with the "first light" images," said Galex Project Manager DR. JAMES FANSON. The telescope has cameras tuned to two colors, the far and near ultraviolet. The two "first light" images were obtained on the mornings of May 21 and 22. Each comprises only four minutes of observing time, yet more than 400 stars and star-forming galaxies appear in the far ultraviolet image and more than 1,500 in the near ultraviolet image. As more data are gathered, astronomers expect the number of galaxies visible in the Hercules field will grow to many thousands. Over the course of the mission, planned for at least 28 months, millions of galaxies may be observed.

The new images are available online at *http://photojournal.jpl.nasa.gov/mission/galex*.

Tools provide earthquake insight

Advanced computer simulation tools now being developed by JPL scientists, together with those at NASA's Goddard Space Flight Center and Ames Research Center, and several universities, may soon provide new insights into the complex and mysterious physics of earthquakes and enable vastly improved earthquake forecasting.

When completed in late 2004, simulation tools on an advanced earthquake modeling system called QuakeSim will help scientists learn more about what makes earthquakes happen.

The tools are based upon the latest technologies. For QuakeSim, the finite elements are tens to hundreds of thousands of measurements of how Earth's crust deforms in response to movement of the giant tectonic plates Earth's land masses ride upon. The measurements are gathered through both ground- and space-based techniques. The latter include global positioning system and interferometric synthetic aperture radar, which measure the "quiet" (non-earthquake) motions associated with plate tectonics and the quake cycle.

QuakeSim Principal Investigator DR. ANDREA DONNELLAN of JPL calls QuakeSim a vital step toward eventual earthquake forecasting. "The deformation of Earth's crust and the interaction between quake faults is a complex 3-D process happening on timescales of minutes to thousands of years," she said. "The availability of space-based data and our current limited understanding of quake processes make this an ideal time to develop a system for studying deformation processes such as tectonics, quakes and volcanoes.

"New quake models developed under QuakeSim are expected to yield future earthquake forecasts that will be used by a variety of federal and state agencies to develop decision support tools that will help mitigate losses from future large earthquakes," she added.

SeaSat team members sought

The Public Services Office is seeking members of the SeaSat project for a special JPL event June 26.

Many later Earth-orbiting instruments developed at JPL owe their legacy to the SeaSat mission. These include imaging radars flown on NASA's space shuttle as well as such Earth-orbiting satellites and instruments as Topex/Poseidon, the NASA Scatterometer, QuikScat and the planned Jason 1.

In the 1970s, JPL engineers and scientists realized the sensors they were developing for interplanetary missions could be turned upon Earth to better understand our home planet. In 1978, JPL built and launched the experimental SeaSat to test a variety of oceanographic sensors including imaging radar, altimeters, radiometers and scatterometers.

The June 26 event will be held from 11 a.m. to 1 p.m. and will include guest speakers and a general gathering for guests.

SeaSat veterans are asked to call Public Services at (818) 354-0112.

Symposium set for July in Pasadena

The fifth International Symposium on Reducing the Cost of Spacecraft Ground Systems and Operations, sponsored by JPL's Deep Space Communications and Navigation Systems Center of Excellence, will be held July 8-11 at the Westin Hotel in Pasadena.

DESCANSO promotes continued innovative work in many areas for planetary explorations, including operational concepts and methodologies. The entire technical program can be viewed online at *http://descanso. jpl.nasa.gov/RCSGSO*, where registration is also available.

The symposium will include:

- An opening session with a keynote speech by DR. WILLIAM WEBER, head of JPL's Interplanetary Network Directorate. His speech will be followed by talks by representatives of the National Space Development Agency, European Space Agency and NASA on their plans, and a panel discussion.
- Technical sessions with 62 papers and 18 posters, in two tracks, over two and a half days.
- An evening at the Magic Castle.
- A banquet with keynote address by PETER THEISINGER, manager of the Mars Exploration Rovers Project.

Contact the organization committee via e-mail at *RCSGSO.Symposium@jpl.nasa.gov* or call ext. 4-0062.

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

Caregivers Support Group—Meets the first Thursday of the month at noon in Building 167-111 (The Wellness Place). For more information, call the Employee Assistance Program at ext. 4-3680.

Codependents Anonymous—Meeting at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Group—Meets the first Friday and third Thursday of the month at noon in Building 111-117. Call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parents Group for Children With Special Needs—Meets the second Thursday of the month at noon in the Wellness Place, Building 167-111.

Working Parents Support Group—Meets the third Thursday of the month at noon in Building 167-111 (The Wellness Place). For more information, call the Employee Assistance Program at ext. 4-3680.

Friday, June 6

Caltech Ballroom Dance Club—A finals party featuring the foxtrot, tango, and waltz will be held starting at 9:30 p.m. in Winnett Lounge. Dress is semiformal. Mini-lessons will be held starting at 9:10. Lessons and party are free, and refreshments will be served. Dancers of all levels are welcome.

Sunday, June 8

The Arroyo Singers—This group that includes members from Caltech will perform "The Opera and the Movies" at 4 p.m. at Calvary Presbyterian Church, 1050 Fremont Ave., South Pasadena. Refreshments will be served following the performance. For ticket information, call (323) 256-5332.

Monday, June 9

Search & Rescue Orientation—JPL's Urban Search & Rescue Team seeks new volunteers and offers this session at noon in Building 180-101. For more information, call Eric Fuller, ext. 4-1091.

Tuesday, June 10

JPL Stamp Club—Meeting at noon in Building 183-328.

Wednesday, June 11

JPL Amateur Radio Club—Meeting at noon in Building 238-543.

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Call Roger Carlson at ext. 4-2295 for information.

Thur.–Fri., June 12–13

Von Kármán Lecture Series—Dr. Michelle Thaller, an astronomer with JPL's Space Infrared Telescope Facility, will discuss the mission Thursday in von Kármán Auditorium and Friday in Pasadena City College's Vosloh Forum. Both lectures begin at 7 p.m. The Thursday lecture will be webcast live at *http://www.jpl.nasa.gov/events/lectures/jun03.html*.

Sunday, June 15

Bike on the Pasadena Freeway—Arroyofest, organized by a coalition of community groups, has the goal of connecting the communities of the Arroyo Seco, from Pasadena to downtown Los Angeles, and show how the Arroyo can become a model for creating more livable communities. Riders will have their choice of distances of 4, 12 and 16 miles. The cost is $10 and goes toward the expense of closing the freeway. Applications are available at the JPL Store or contact Claudine Chen, ext. 4-5752, for an application form or if you're interested in volunteering. You can also register online at *www.arroyofest.org*.

Tues.–Wed., June 17–18

Investment Advice—TIAA/CREF representatives will be available for one-on-one counseling. For an appointment, visit *www.tiaa-cref.com* or call (877) 209-3140, ext. 2614.

Thursday, June 19

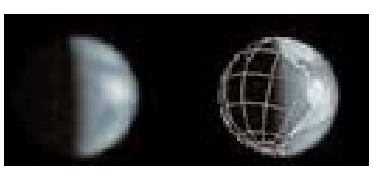
TIAA/CREF Enrollment Meeting—This workshop, from noon to 1 p.m. in T1720-137, is designed to assist employees newly eligible for the Caltech/JPL retirement plan with selection of investment options and the completion of their enrollment forms.

Saturday, June 21

CEC Wine Tasting Benefit—The JPL/Caltech Child Educational Center hosts the fundraiser from 6:30 to 11 p.m. at Caltech's Avery House, 293 S. Holliston Ave. in Pasadena. The event will also include great food, and live jazz from the Chad Edwards Quartet. Guests may bid on unique auction items and take their chances at the gaming tables. All proceeds benefit the nonprofit CEC. General admission tickets are $35; Connoisseur tickets include entry into a private tasting room with premium wines, and are $65. Tickets are available at the JPL Store and at the CEC, 140 Foothill Blvd. in La Cañada. Tickets may also be purchased at the door the evening of the event for an additional $10. Call ext. 4-3418.

First-ever snapshot of Earth from Mars

By Paul Morledge



PIA04531

Globe diagram illustrates the Earth's orientation as viewed from Mars (North and South America were in view).

Have you ever wondered what you would see if you were on Mars looking at Earth through a small telescope? Now you can find out, thanks to a unique view of our world recently captured by JPL's Mars Global Surveyor spacecraft currently orbiting the Red Planet.

This first-ever image of its kind not only shows Mother Earth as a tiny alien world in the vast darkness of space, but also includes a view of the giant planet Jupiter and some of its larger moons. The camera aboard Mars Global Surveyor photographed both planets in an alignment, as seen in the evening sky of Mars, at 6 a.m. Pacific Time on May 8.

"From our Mars orbital-camera perspective, we've spent the last six-and-a-half years staring at Mars right in front of us," said Dr. Michael Malin, president and chief scientist of Malin Space Science Systems, of San Diego, who operates the camera aboard Mars Global Surveyor. "Taking this picture allowed us to look up from that work of exploring Mars and take in a more panoramic view. This image gives us a new perspective on that neighborhood, one in which we can see our own planet as one among many."

The image is available online at *http://www.msss.com/mars_images/moc/2003/05/22*.

The image of Earth actually shows our home as a planetary disc, in a "half-Earth" phase. The image has been specially processed to allow both Earth and the much darker moon to be visible together. The bright area at the top of the image of Earth is cloud cover over central and eastern North America. Below that, a darker area includes Central America and the Gulf of Mexico. The bright feature near the center-right of the crescent Earth consists of clouds over northern South America.

The image also shows the Earth-facing hemisphere of the moon, since the moon was on the far side of Earth as viewed from Mars. Also visible are Jupiter and three of its four Galilean moons: Callisto, Ganymede and Europa.

Theatre in the rectangle

By Paul Morledge

The great sculptor gravity ensures that larger, denser objects in the universe—like stars, planets and moons—take on the familiar spherical shape. Occasionally, though, an interplay of mysterious cosmic forces leaves objects outside the round, those with more geometrically curious forms. One such object, discovered in 1975, is the Red Rectangle.

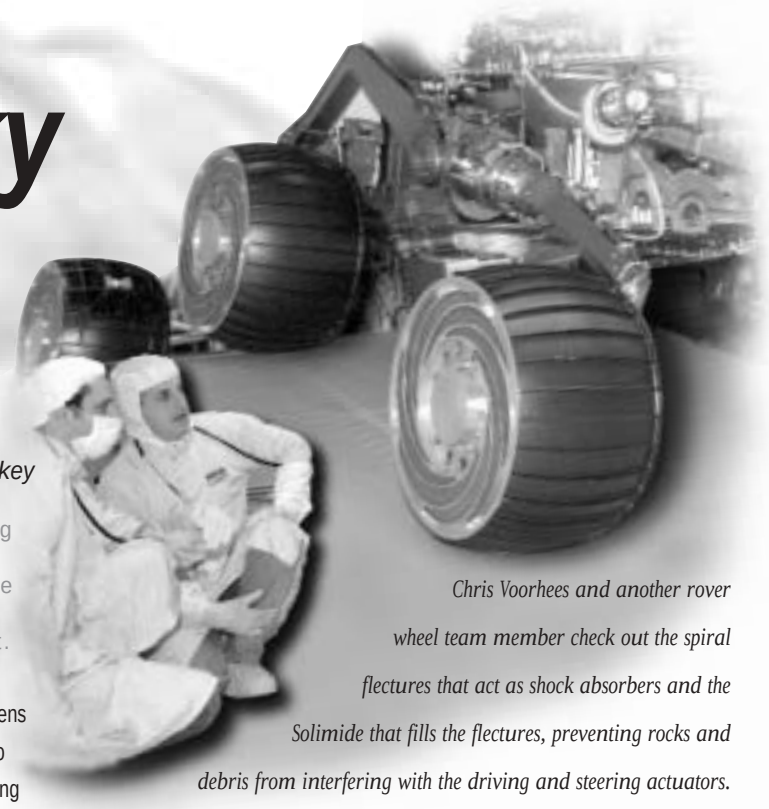
Now astronomers Dr. Raghvendra Sahai of JPL and Dr. Carmen Sanchez Contreras of Caltech have uncovered a physical mechanism that might support this bizarre red rectangular structure. They reported their findings in a paper titled "A Very Young, Fast, Bipolar Outflow at the Center of the Red Rectangle" at the 2003 summer meeting of the American Astronomical Society in May in Nashville, Tenn.

A protoplanetary nebula forms when a red giant star ejects most of its outer layers, and is observable when dust within the nebula reflects light from the central star. Subsequently, as the very hot core (six or more times hotter than the Sun) gets further exposed, the cloud of ejected material becomes bathed with ionizing ultraviolet light, which makes it glow. At this later stage these objects are known as planetary nebulas.

The Red Rectangle, or HD44179, represents the crimson light from a protoplanetary nebula that lurks about 1,000 light years from Earth. Images taken with the sharp eyes of the Hubble Space Telescope show that two bright diagonals intersect its roughly rectangular shape; the diagonals appear connected by straight lines parallel to the short side of the rectangle.

An image of the Red Rectangle and its bipolar outflows may be seen on the Web: *http://photojournal.jpl.nasa.gov/catalog/PIA0453*.

Wheels in the Sky



Chris Voorhees and another rover wheel team member check out the spiral flectures that act as shock absorbers and the Solimide that fills the flectures, preventing rocks and debris from interfering with the driving and steering actuators.

By Colleen Sharkey

When Chris Voorhees thinks about wheels, he doesn't imagine the rubber hitting the road, but rather aluminum crawling across the surface of Mars. In fact, he has already seen some of his handiwork making its way across the Red Planet.

One of the first jobs Voorhees was handed as an intern was stamping out more than 1,000 stainless steel cleats for the Sojourner rover on JPL's Mars Pathfinder mission in 1997. Fast-forward six years and tack on a 365-pound weight-gain and mobility specialists are dealing with a whole new animal—the large twin "robot geologists" known as the Mars Exploration Rovers, preparing for launch this month.

"We started with the Sojourner wheels as a base to work from," Voorhees said. "Because of many different engineering demands, the wheels for our new rovers didn't mature until late in the game."

Mobility engineers were tasked with making the wheels lightweight, so as not to add any more weight to an already hefty spacecraft; compact, so that when the rover is stowed in the lander they would fit; and capable, so the twin geologists can maneuver off of the lander safely and climb rocks up to 10 inches high. Basic parameters were set—based on the weight of the rover and the contact area on the sur face—and then the challenge began to make the wheels deliver on all requirements.

A Design to Keep on Turnin'

The rocker-bogie suspension that was developed for Sojourner, the first vehicle to rove on another planet, will be used again in a modified design. This flexible mobility system allows the wheels to conform to obstacles like rocks, strengthening their grip and maximizing their ability to clear any "road blocks." At a little more than 10 inches, these aluminum wheels are twice the size of those on Sojourner and are missing the recognizable sharp cleats.

"A big challenge is to be able to get enough traction to get through soil and over rocks but also to be benign enough to get off of the lander without getting entangled in the deflated airbags," Voorhees said. The design is "basically like a paddlewheel that is machined onto the outside of the wheel, providing both safety and capability."

Each wheel has its own drive and steering actuators, which control movement and direction. The internal volume that each wheel can hold was increased to house both systems within the wheel's crown-shaped design. When steered, the wheel's unique shape bears the load continuously from inside to outside and prevents it from riding up on its outside edge.

Hubcaps to Minimize the Shock

Inadvertently adding to the rovers' panache are the spiral flectures. The futuristic-looking "hubcaps" were chosen over dozens of other flecture and spoke options and are designed to absorb shock and to protect the rest of the vehicle during driving. Next Intent, a San Luis Obispo company that specializes in machining complex shapes, manufactured the wheels. The overall wheel design allowed them to machine each wheel from one piece (or billet) of aluminum. Being able to use just one piece of aluminum minimizes what's called scar mass, or useless leftover material where parts would join and makes the wheel stronger, Voorhees noted.

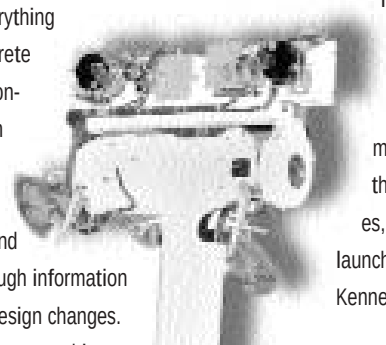
The outside of the wheels are anodized, or covered with a black coating, to provide additional strength. This smooth surface also minimizes the threat of the wheels getting caught up in the deflated airbags.

The "orange filling" between the spaces in the spiral flecture is an open-cell foam called Solimide. It was cut into crescent shapes and bonded to the wheel.

"The idea came from a concern that because the wheel has an open geometry design to the drive and steering actuators, it could pick up rocks and debris and cause a problem," Voorhees said. "We needed to fill the gaps but still be flexible—we couldn't use a solid for shock absorption. Solimide maintains its flexibility even at very low temperatures so it's ideal for conditions on Mars."

Test Tracks: A Race Against Time

Planning such a complex mission is, as Voorhees said, a race against time. Designs are fluid and subject to intense testing and subsequent change. While nothing can substitute for being on Mars, the next best thing is to run trials in simulated Martian environments at JPL's testbeds. An obstacle course dubbed the "rock gauntlet" challenged test wheels to scale everything from small rocks to concrete blocks. Engineers also conducted airbag interaction tests in which they drove the wheels into the deflated airbags again and again until they had enough information to proceed with wheel design changes. The mobility team and the assembly test and launch operations team gathered to conduct ramp tests with the flight rovers to make sure the rover brains were communicating effectively with its legs and wheels.



Preparing for the Rover's First "Steps"

Preparing a robot to perform to exact specifications on a harsh planet millions of miles away is no easy task. Still, the excitement of sending a spacecraft to another planet has not waned. While engineers are anxious to see Mars through the eyes of a rover again, they know that the deployment process will be slow and precise once the rovers land on Mars in January 2004. Once the lander petals open and the rover "wakes up," it may take up to five days for it to drive off the lander.

"It's hard to explain the minutiae—everything has to work exactly as you plan," Voorhees said. "After every command sequence we give to the rover, we have to wait to make sure everything is working properly before we proceed. And due to the delay in sending and receiving signals from Earth to Mars and back, it's like taking 20 minutes just to talk to yourself!"

When ground controllers confirm that all systems are working as they should, they will tackle the decision of which direction to go. Nearby obstacles like rocks or deflated airbags will determine the safest route to leave the tetrahedron-shaped lander. As it emerges from the lander, its interplanetary cocoon, the rover will not be breaking any speed records to conduct its research. Top speed for the rovers is 5 centimeters (2 inches) per second. However, as many scientists and engineers are quick to point out, the goal is not to travel as far and fast as possible, but to uncover the most interesting science wherever it presents itself. And as long as the wheels do their job, Voorhees and the mobility team can live without wheelies.

During Mars Exploration Rover hardware development, Voorhees was one of two cognizant engineers for the rover's mobility system. In preparation for the launches, he is currently serving as the assembly, test and launch operations integration engineer for the MER-2 rover at Kennedy Space Center in Florida.

The rover wheel team tests the rover's suspension and wheel capability on staggered ramps in JPL's Spacecraft Assembly Facility.

Passings

ROY LEVY, 80, retired from Section 332, died Jan. 2.

Levy joined JPL in 1968 and retired in 1995. He is survived by his wife, Loretta. Services were private.

STANLEY KENNEDY, 77, retired from Section 352, died April 10.

Kennedy joined JPL in 1964 and retired in 1988. He is survived by his son, Scott.

JAMES KELLEY, 67, technical manager for the Keck Interferometer Project, died May 15.

Kelley had worked at JPL since 1962. He is survived by his wife, Catherine Evans, and children Clair and David.

The family has requested that donations in Kelley's memory be sent to the amyotrophic lateral sclerosis (ALS) Association. For information, call (888) 949-2577.

CHRISTOPHER STEIN of Section 352 died May 19. He had worked at the Lab since 1994.

He is survived by his mother, Marion, brother Michael, sister, Kathryn Bean, and nieces Elana and Anna Bean.

PAUL MORLEDGE, 34, a media relations specialist in the Office of Communications and Education, died unexpectedly May 24 due to previously unde-tected cardiomyopathy (heart enlargement) with fatal cardiac arrhythmia.

Paul Morledge

Morledge joined JPL in 2002 and supported the Space Infrared Telescope Facility and other JPL missions. He is survived by his mother, Rosemary Peters; his father, Dr. John Morledge; and siblings Kirk, Scott, Jim, Ann Dodge and Beth Webb.

Services were scheduled for June 7 in Madison, Wisconsin.

In lieu of flowers, memorials may be sent to the Paul Morledge Memorial Fund, Challenger Center for Space Science Education, 1250 N. Pitt St., Alexandria, VA 22314.

Letters

I wish to thank my friends at the Lab for their condolences and thoughtfulness on the passing of my father Leonard. He had a special fondness for our work and the plant sent from the Lab will help bring warm memories to us.

Tom Cwik and family

Classifieds

For Sale

APPLIANCES: Kenmore; washer, $100; white, large-capacity electric dryer, only 1 year old, $250. 249-0121.

AQUARIUM, 35-gal. glass Eclipse tank with hood, light, heater, air pump, filter, no stand, $75/obo. 626/627-5442.

ART, R.C. Gorman signed print, "woman in orange," circa 1977, call for e-photo; FILE CABINET, rolling, metal, w/shelf, and folders, $10; AROMATHERAPY KIT, new, in apothecary box, $15; FRANCISCANWARE, desert apple pattern, misc. pieces, incl. platter. 626/398-4960.

BABY ITEMS: Graco 3-spd. musical swing, $25; Gymini Infant Gym w/extra toys, $20; classical music crib mobile, $10. 790-6395.

BABY ITEMS: Century Infant Carrier, $5; bathtub, large, $5; pillow headrests, $2; soft toy, $3, all in exc. cond. 626/850-4378.

BIKE, '94 Trek 2120 Touring, 54 cm. frame, ice violet, Trek carbon/Easton Al stays frame, w/Shimano SPD pedals, Shimano RX100T (triple-21 gear) crankset, Shimano Deore LX derail-leurs w/SIS bar end shifters, 22.8 lbs., exc. cond., < 300 mi., orig. $1,000, sell for $450. 790-2123.

CARD SHUFFLER, Johnson, collectible, all-metal construction except for friction wheels that drive cards & carved-wood dowel handles, stands ~6" handle-high, and ~9" by 6", flanges and handle inclusive, $35; PORT REPLICATOR, for IBM Thinkpad, works with T20, T21, A20, A21, or X, R series, like new, $85; DIET TAPES, Jenny Craig, set of 14, $50. 790-3899.

CELL PHONE, brand new, "in the box" T-Mobile, digital, photo, with battery charger, batteries and ha00+, $95/obo; 2 pc./jacket & slacks, Rena Rowan for Saville, white, lined, size 14, never worn; pockets still stitched, $40/obo. 626/398-4960.

COFFEE MAKER, Braun 10-cups, white/black, like new, $30/obo. 626/791-6101.

COMPUTER DESK, lots of storage space and place for printer/CPU, $60. 243-8255.

COMPUTER DESK AND, spacious, with 4 drawers, light beige veneer, comfortable; CHAIR, rolling office "executive," black leather upholstery; both in vg cond., great for home office, $95/desk, $95/chair, or $170/both. 626/792-2431, weekday eves. only, 6 to 8 p.m.

DINING TABLE, glass top w/chrome base and 6 upolstery and chrome chairs, good cond., $200/obo. 626/359-2415.

DINNER JACKET, men's formal, burgundy, size 40 long, like new, nice for cruises and other formal occasions, $25; JACKET, men's, down insulated for cold weather, 40 long, good cond., a $100 value, $18. 626/793-1895.

DVD PLAYER, Progressive Scan Toshiba SD-3750, like new, features: 3:2 digital cinema progressive conversion, enhanced audio mode/dialogue expander, 540-line output, 4x digital picture zoom, CD/DVD text display for titled discs, plays audio CD/CD-R/CD-RW/DVD/video CD, cheapest web price is $199.95, sacrifice for $100; ORGAN, Yamaha 415 electronic w/13 pedals, 3 keyboards, 144 rhythm patterns, $2,000. 790-3899.

FRYING PAN, extra large, black cast iron, vintage 1920s, $12; DINNER PLATES, four, USA, brown glazed, 10", collector quality, $10; FRUIT/NUT TRAY, wooden, monkey-pod carved, very nice cond., $7. 626/793-1895.

FURNITURE: Rosewood & walnut Victorian; 3 side-chairs upholstered in woven tapestry; armchair, red velvet upholstery; carved marble-top center table; tufted medallion-backed sofa, Eastlake, circ. 1840, sofa, striped fabric; 17th century drop-leaf dining table & 2 cane-backed William IV side chairs, no reasonable offers refused. 790-9093.

GAME CUBE SCREEN, only used a few times, battery pack and Tarzan game included, $125. 957-2852.

HIGH CHAIR, great cond., $14. 626/448-8809.

INFANT/TODDLER TOYS: Evenflo Super-Exersaucer, $15; walker, Fisher Price, $7; activity center, Fisher Price, $5; doll stroller, $3; musical push toys, $3/ea., all gd. cond.; CRIB MOBILE, classic Winnie the Pooh musical, exc. cond., $20. 626/256-6606.

KARAOKE MACHINE, exc. cond., dual cass., equalizer, echo, other, $40; cass. also avail.; VACUUM, Eureka, 5 yrs. old, Excalibur model, 12 amps, $30; PLAYHOUSE/ TENT, Winnie the Pooh, like new, $20; STATIONARY ENTERTAINER, Kolcraft Rock-It, fun for baby, exc. cond., $25. scrap_maniac@yahoo.com for pictures.

MICROWAVE, Toshiba, lg. older model, works well, comes w/original microwave cookbook, $25. scrap_maniac@yahoo.com for pictures.

MISC: table lamp, ceramic, 40" tall, $20; air cleaner, Sears HEPA, like new, $50; floor lamp, brass torchiere, $5; carving knife, Sunbeam electric, $5; step stool, metal, 11", $3; blood pressure tester, automatic, $10. 626/355-6923.

MOUNTAIN BIKE, 2003 Trek 4900, exc. cond., under 10 mi., must sell due to arm injury, 21.5" frame, custom shifters, Bell one-size black helmet included, $500. 626/399-3355.

MOUNTAIN BIKE, Timberline GT Custom 4130, green, used 1 season, stored inside, purchased in '98, $300. 626/355-0474.

MOUNTAIN BIKES, 2 smaller-sized, 24" wheels, appropriate for kids or shorter adults, both are sturdy and hi-quality, good operating condition, knobby mountain tires, 21-speed shifting, Ridgid frame style: no "suspension," $70/each, negotiable. 626/395-2064, days.

ORGAN, Lowrey w/bench, 2 keybrd, bass pedal, manuals, + Leslie speaker system, model-710, organ needs some electronics repair, $1,500/obo. 626/359-2415.

OUTBOARD MOTOR, '90 Mercury, 4 HP, portable, 2-stroke, internal tank, great for dinky, $475. 661/255-5645.

PICNIC TABLES with attached benches, Kid-Proof 2-step brand, $40. 243-8255.

PRINTER, HP Deskjet 3420, new in box, never opened, purchased as part of a pkg., color ink-jet w/photo quality up to 2400 color dpi, up to 10 ppm bw and 8 ppm color, great entry-level, retails $79.99, sell for $50. 259-5526 Sandy.

PRINTER STAND, mobile, faux wood grain, extending table-top swings up and down, good cond., $60. 248-6062, Elizabeth.

REFRIG./FREEZER, GE Profile model TPX24PR, side by side, 23.5 cu. ft., with ice cube/water dispenser, exc. cond, accepts panels on front to match to cabinetry, includes solid maple panels, $750; CRIB, Childcraft, maple, double drop sides, contemporary styling, exc. cond., includes mattress, $150. 805/499-1615.

SCOOTER, electric powered, used, great child's gift, battery changer incl., $125. 957-2852.

SNAKE CAGE, stained, finished pine, with glass door, controlled heat and lighting, approx. 20" x 18" x 32" high, $110. 341-1798, Darrell.

SPEAKER/AMP AND MICROPHONE, 2 channel, 50 watt, only used about 5 times, good cond., $200. 248-6062, Elizabeth.

SPORTS TRAINING NET for baseball/softball/soccer, galvanized steel frame, exc. cond., was over $120, sell for $50. 626/850-4378.

STOVE, gas, Magic Chef, slide in, almond, electronic controller, good cond., 10 yrs old, $10. 626/794-2431.

TABLES, 2, custom-designed rod iron, glass top, in/outdoor, $1,500; COMPUTER DESK, $100; OFFICE CHAIR, $35/obo. 248-1102.

TEA SET, pottery, made by Maine artisan, nautical theme, matching lighthouse design on all pieces, incl. tea pot, creamer, sugar, platter, small serving bowl, 2 mugs, 2 Japanese tea cups; never used, $100 for set. 249-4316.

TREES: red banana plant 5' tall, $60/obo; fish tail, 6' tall, $80 obo; fichus, >10' tall, braided, in 30" plastic pot, $250/obo; CERAMIC BOWL, gray, 2' diam. w/planted geraniums, $40/obo. 626/791-6101.

TV, 26" Sylvania console, color, $25. 626/359-7666.

WASHER/DRYER, Kenmore, good cond., $150 for both. 626/571-6061.

WASHER, GE 8-cycle, 2-sp. heavy duty super capacity, orig. purchased in Dec. 1995, exc. cond., works great, never goes off balance, $175. 626/791-2784.

WEDDING GOWN, brand new, never worn, beautiful, Italian satin, designer, lace-up back, cap sleeve beaded bustier, traditional skirt, incl. matching wrap, $800/obo. 626/794-9200, Kristy.

WEDDING GOWN, white duchess silk sheath by Amsale, low back, gorgeous detachable train, fit ~sz. 2-4, elbow length white tulle veil; $1,000 for set/obo; FIGURINE, Lenox porcelain, bride & groom "wedding cake topper," 7," never used, orig. box, wonderful gift, $50. 249-4316.

YARD SALE: furniture, clothes, electronics, sports equipment, books, household items; Sat., June 7, 8 a.m.-4 p.m., 2019 Fletcher Ave., South Pas.

Vehicles / Accessories

'98 ACURA CL, 2.3 coupe, 46,000 mi., exc. cond., 5 speed, white exterior, sand interior, sunroof, alloy wheels, spoiler, CD player, like new, very clean. 626/577-2751.

CAR COVER, for Mazda 626, Evolution 4 fabric, new condition, $25. 661/254-3119.

CAR ROOF CARRIER SYSTEM, Yakima, 2 bikes & 4 skis (or 2 snowboards), 2 X 48" roundbars, 4 X doublecross towers, 2 X upright bicycle carries w/locking arms, 2 X extra lock cores, 2 X Promo ski mounts; assortment of nuts/bolts, + instructions, e-pictures upon request, total value $400+, sell $210. 909/621-9722.

'68 CHEVY Corvette coupe, 4-spd manual, 427 CID, 390 HP motor, QJet carb., Blue ext./blue int., T-top (2 sets), mag wheels, alarm, car cover, owned 24 years, rarely driven, retired senior, $18,000/firm. 626/792-9053, Ray.

'00 COACHMEN Futura trailer, slps. 6, queen size bed and bunkbeds, many extras, low usage, exc. cond., $16,000. 661/255-7958.

'93 DODGE Grand Caravan LE, 3.3 V6, leather, quad seats, dual air, CD, 7 pass, full pwr. + more, 139K mi., average cond., versa-tile seating or cargo van, $2,900. 805/584-2721.

'98 FORD Crown Victoria LX, 4.6L V8, 4 dr., white/beige, leather, CD, keyless entry (remote & keypad), cruise, pwr. everything, 100K, split front seats, gd cond., $11,500. 822-6465, Ryan or code3media@crownvic.net.

'97 FORD Mustang GT, black beauty, 10K mi., on '99 4.6 V8, 5 spd., ABS, full power, Mach 460 sound, custom wheels, rear spoiler, exceptional cond., $10,475. 661/943-6552.

'96 HONDA Accord, exc. cond., EX model, V6, 4 door, auto, leather int., moonroof, must see, $7.5K/obo. 626/945-7040, Alex.

'93 INFINITI J30, blk/blk, Bose am/fm/cd stereo, auto air, 94K, good cond., removable ski rack, $4,750. 790-6122.

'89 ITASCA, 32' Windcruiser class A motor-home, 19,400 mi., GMC 30 chassis, 454 w/Banks power pack, generator, queen bed island, 3-way appliances, 2 rooftop a/c, TV, VCR, antenna, connections for cable/satellite, back-up CCTV, leveling jacks, tire pressure warning system, hitch receiver, lots of storage, very clean, $24,000. 626/335-7345.

'96 JEEP Grand Cherokee Laredo, 6 cyl. 4L, auto, 2 wheel drive, 67,000 mi, a/c, power s/w/dl, cc, multi CD, new tires, exc. cond., $7,000/obo. 626/355-0551, Alison.

'92 JEEP Cherokee Sport, 4 X 4, w/4.0L, only 38,100 mi., exc. cond., mud/snow tires, $5,200. 323/258-5250.

'88 JEEP Cherokee Chief, red, 4-whl. drive, clean interior & body, $2,800. 626/359-7666.

'90 MAZDA MPV, 4 x 4, 3.0L V6, ABS, alloy whls., a/c, load leveler, pwr. everything, cruise control, 143K, seats 7 adults, fold bench seats or take out for even more cargo space, runs great, well maint., orig. owner, current reg. & emissions, $2,995. 626/256-6606, Joe.

'78 MERCEDES BENZ 450SLC, recently rebuilt V8 hi-comp. engine, power everything, lots of mechanical work, will need paint and interior work, has new dashboard, factory manuals, and lots of mechanical odds and ends, pics. avail., $4,500. dahun@pacbell.net, Peter or 661/252-9777, after 5 p.m. and on weekends.

'00 MERCURY Cougar, 25,000 mi., exc. cond. inside/out, a/c, pwr. s/w/d, am/fm/stereo/CD, dual front airbags, 4-whl. ABS, flip-up roof, rear spoiler, prem. whls., silver. 909/980-1702.

'92 MITSUBISHI Eclipse GS, 16 valve, 5 speed, air, pwr. windows/door locks, am/fm/CD, flip-up sunroof, alloy wheels, 140K mi., very clean, runs & looks great, sacrifice at $2K/obo. 249-9437, eves.

'95 NISSAN 200SX SE-R, silver, 2 dr., 5 spd. manual, 4 cylinder, pwr. drs/wnd/steering, tilt wheel, cruise, am/fm/cass, sunroof, new clutch, alloy wheels, spoiler, 122K mi., runs great, $4,299. 626/794-7430.

'92 NISSAN Maxima, burgundy, moonroof, a/c, stereo w/CD, power antenna, dash and car cover, vg cond., $4,900. 909/225-2323.

'89 NISSAN 240 SX, hatch, 5 speed, sunroof, 1 owner, reliable, 124 K mi., $1,800/obo. 626/674-0583.

'96 PONTIAC Firebird/Formula, 3.8L V6, dk. grn mtllc./graphite cloth, 53,559 miles, 1 owner, 16" alloys, limited slip, 4-spd auto, pwr. windows, 10-spkr. sound, pwr. ant., dash & car cover, V8 pkg. w/o V8, all receipts, pics avail., $8,700. dahun@pacbell. net, Peter or 661/252-9777, after 5 p.m., and on weekends.

'96 PONTIAC Grand Prix SE, white, 2 dr., V6, AT, am/fm stereo, ABS, airbags, custom wheels, rear spoiler, exc. cond., $5,495/obo. 661/943-6552.

ROOF RACK GEAR, Yakima: 1 pair 48 in. tower racks, rail-rider mounting, $40; 1 pair locking ski mounts, sport style, holds 4-5 pair of skis, $30; std. bike mount sets (fork block/wheel tray/spare wheel fork) for use on any Yakima rack, $25/ea. 790-2123.

'95 SATURN SC 2, black, 99K mi., a/c, cass., tinted windows, alarm, 1 owner, new clutch/brakes/catalytic converter/CV joints, maint. records, $2,995/obo. 323/258-7037.

'94 SATURN SL2, 4 dr., auto, air, am/fm/cass., ps, tilt, 34 mpg, exc. cond., dealer record of maintenance, $2,900. 790-3919.

'98 TOYOTA Sienna van, earth-toned exterior and interior, 2 sliding doors, captain chairs, loaded w/features, alarm & keyless entry, ScotchGuard protection, transferable extended warranty, approx. 64,000 miles, first owner, clean, exc. cond., $14,900. 626/850-4378.

'94 TOYOTA Camry LE sedan, 4D, V6 3.0L, 94K mi., gold, leather interior, orig. owner, great cond., $5,200. 805/499-1615.

'02 VW Jetta, auto, moonroof, 5K mi., power doors/windows, heated mirrors, blue, Monsoon sound system, $14,000. 909/599-3230.

'74 VW Bug, really good cond., high-performance 1600 engine, 26 MPG city, new tires, needs no work, $2,800. 626/791-3797.

Lost & Found

LOST: keys, Tues., 5/27, somewhere on Lab, brass belt clip, blue light and many keys, incl. VW keys. Ext. 4-9363.

LOST: women's bracelet, on Memorial Day. Ext. 3-5324

FOUND: pair of men's prescription sunglasses, on 2nd floor mail shelf of Bldg 198 on or about week of May 19. Ext. 3-7642, Stephanie.

Wanted

SPACE INFORMATION/memorabilia from U.S. & other countries, past & present, for personal use. 790-8523, Marc Rayman.

VOLLEYBALL PLAYERS, coed, no beginners please, Tues. nights 8 to 10:00 at Eagle Rock High School, $3/nt. 956-1744, Barbara.

Free

DOG, Lhapsa Apso, 4 yrs, white and tan, pedigree/no papers, neutered w/shots on 5/9/03, to good home. 909/996-0540, cell.

PLYWOOD, 4 sheets, 3/4-inch, used, slight damage, can deliver if close. 626/797-6982.

TOILET, American Standard; SINKS, two blue porcelain. 626/794-0081, Bonnie.

For Rent

GLENDALE, townhome-like duplex, 2 bd., 1.5 ba., din. rm., liv. rm., private patio, close to JPL, $1,300. 246-7365, Rose.

GLENDALE, 5 min. from JPL, 2 bd., 2 ba., good school district, a/c, wood flooring, pool, view. 667-5569.

LA CANADA, single-story traditional home, move-in condition, 3 bd., 3 ba. + large family room, large lot, badminton court and mature oak trees, La Canada schs. 626/396-3990.

PASADENA, spacious 2-story condo, 3 bd., 2.5 ba., prestigious community, beautiful inter., bright ktch., prof. landscape, ctrl. air & heat, close to shop., cozy LR w/FP, end unit, frml DR, hdwd. flrs., immac. cond., close to schls., $1,750. 626/396-9024.

PASADENA house, 2 bd., 2 ba., 1,200 sq. ft., newly remodeled, stove, DW, hookups, 2 fireplaces, no pets, 1000 N. Mar Vista Ave. in Bungalow Heaven, avail. for 12-mo. or longer lease, $1,895, security dep. $1,995 OAC. 626/795-3282 ext. 106/107.

PASADENA, 1 bd., 1 ba., avail. in a partially furn. 2 bd., 2 ba., apt. to share, nr. Caltech & PCC, subterranean parking, fireplace, balcony, recently remodeled, C/A, washer/dryer in unit, $675/negotiable. 626/564-9511.

PASADENA, nice home in Upper Hastings Ranch, 3 bd., den, 2 ba.; pool, spa and large yard, overlooking golf course; remodeled kitchen/baths, cent. air/heat, washer/dryer, refrig., 1-yr. lease required, $3,200, incl. gardener & pool service, avail. 6/28. 626/351-9641.

PASADENA apt. to share., 2 bd., 2 ba., very large unit, 3 miles to both JPL & Caltech, and 1.5 miles to Colorado Blvd. main strip, w/ sub. parking, pool, laundry, $750. 626/796-0232.

PASADENA, townhome-style apt., 2 bd., 1.5 ba., cent. air/heat, dishwasher, priv. patio, laundry facility on premises, unfurn., parking, close to Caltech & JPL, $1,250 + util., avail. 6/21. 626/351-9641.

SIERRA MADRE townhouse to share w/Caltech alumna, 1,000 sq. ft., large patio, 2 bd., 1.5 ba., quiet street, garage parking, washer/dryer $605 + 1/2 utils. 626/355-4838, Heather.

SOUTH PASADENA, 2 bd., 1.5 ba., 1,100 sq. ft., 2 story apt., a/c, dishwasher, gated garage, pool, laundry room, no pets, $1,150. 626/799-1691, Brian.

Real Estate

LA CRESCENTA home, high above Foothill Blvd. on Cloudcrest Rd., 10 min./JPL, 3 bd., 2 ba., ranch w/lg. deck & panoramic views of city, mts, and ocean, enclosed patio with spa (no pool), off-street access assures security, privacy, $498,000. 626/395-2064.

Vacation Rentals

BIG BEAR LAKEFRONT, luxury townhome, 2 decks, tennis, pool/spa, beautiful master bd. suite, sleeps 6. 949/786-6548.

CAMBRIA, ocean front house, sleeps up to 4, excellent view. 248-1102.

COSTA RICA, Pueblo Real, Quepos, 2 bd., 2 ba. condo, fully eq'p'd kitchen, TV, VCR, slps. 6, air, remodeled, large pool, tennis, near Manuel Antonio, next to river w/mangroves and monk-eys, close to beach, JPL rates, see at Photoisland.com, Andalusian password "condo." luisalfaro@earthlink.net or 760/723-8522.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn. phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps 4, laundry fac., Low Season rate $105/nite/2, High Season rate $120/nite/2, $15/nite/add'l person. 949/348-8047, or jackandrandy@cox.net.

LAKE TAHOE, N. Shore condo, 2 bd., 2.5 ba., sleeps 6, private beach, pool, all amenities, fully furnished, convenient location, 2 miles to casinos, avail. by the week only, JPL discount rate, $700/week (7 nights) includes cleaning, taxes. 626/355-3886, Rosemary/Ed.

LAKE TAHOE, timeshare at the Ridge Tahoe, Cascade building, gorgeous 5-star resort, floating week in a 2 bd., 2 ba., with lock-off option (turns your 1 week into 2), indoor recreation complex with a pool, weight room, racquetball courts, restaurant and lounge, a private gondola connects you to Heavenly Valley Ski Resort, beautiful winter and summer, $15,500. tahoe@dworldstudio.com.

MAMMOTH, Snowcreek, 2 bd., 2 ba., +loft, sleeps 6-8, fully equipped kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/mtn. view, Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL disc. 626/798-9222, 626/794-0455 or valerie@gps.caltech.edu.

OCEANSIDE condo, fully furn., 2 bd., 2 ba., fireplace, full kitch., quiet, relaxing, beautiful beachside setting, BBQ/pool/spa/ game rm., great ocean view, easy walk to pier & restaurants, slps 8, avail. weekly or monthly. 909/981-7492, Darlene or dfhauge@yahoo.com.

OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier & harbor, pool/spa, game rm., sleeps 4. 949/786-6548.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.

JPL'S ONLINE NEWS SOURCE

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Notice to Advertisers

Advertising is available for JPL and Caltech employees, contractors and retirees and their families. No more than two ads of up to 60 words each will be published for each advertiser. Items may be combined within one submission. Ads must be submitted via e-mail to universe@jpl.nasa.gov *and are due at 2 p.m. on the Monday after publication for the following issue.*

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